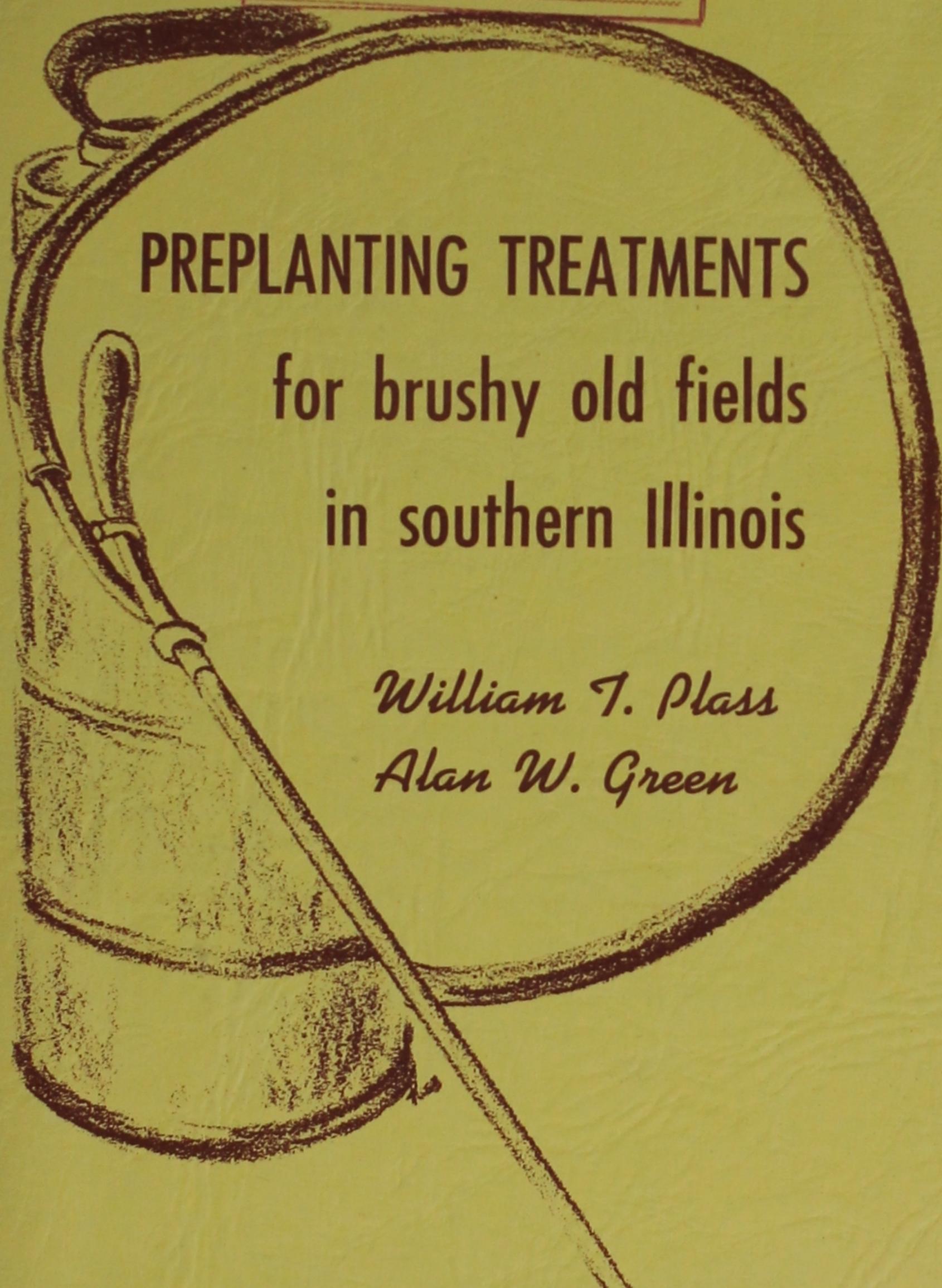


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PREPLANTING TREATMENTS
for brushy old fields
in southern Illinois

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NOTICE

For several decades, the U.S. Forest Service has been publishing its research findings in a variety of ways. In the interest of simplicity and uniformity, all of the old series issued by the 10 Forest Experiment Stations have been discontinued and three new ones established to replace them. Effective January 1, 1963, all research documents printed or processed by the Forest Service will be classifiable under one of these three categories:

1. A numbered series entitled *U.S. Forest Service Research Papers*.
2. A numbered series entitled *U.S. Forest Service Research Notes*.
3. A numbered series entitled *U.S. Forest Service Resource Bulletins*.

Each publishing research unit will be identified by a prefix before the number, and the numbers will follow in order of publication. For example, our first paper in 1963 is classed and numbered "U.S. Forest Service Research Paper CS-1."

We call your attention to the reference cards included in all research papers.

THE AUTHORS



WILLIAM T. PLASS has been with the Central States Station for nearly 15 years. He received his Bachelor of Science degree from Iowa State University in 1948 and a Master of Science degree from the University of Missouri in 1959. He has served on the Forest Survey in Kentucky, as Superintendent of the Vinton Furnace Experimental Forest in Ohio, and as Superintendent of the Kaskaskia Experimental Forest in Illinois. Bill is now assigned to our Carbondale, Illinois, research center and is responsible for regeneration research in the upland hill country of southern Illinois.



ALAN W. GREEN joined the U.S. Forest Service in 1955 as a research forester in silviculture and regeneration at the Station's branch office in Carbondale, Illinois. Three years later he was transferred to Iowa where he served as Superintendent of the Amana Experimental Forest. In 1961 he was again reassigned, this time to the Foreign Forestry Services in Washington. Alan holds both Bachelor and Master of Science degrees in forestry from Purdue University. He is a member of Xi Sigma Pi (honorary forestry society) and the Society of American Foresters.

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PREPLANTING TREATMENTS

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Old fields with a grass and scattered-low-brush cover are generally good planting sites for pine; planting is easy and the survival and height growth are generally good. Brushy old fields are a different story. When pines are planted, the hardwood brush must be eliminated or its density reduced so the planted trees can become established and make satisfactory growth. Brush removal may also make the planting operation more efficient. Removing brush is easier said than done, however. So procedures developed for planting brushy old fields in the Central States must include preplanting treatments to eliminate or reduce the density of the brush cover.

A study to determine the effect of several preplanting treatments on the survival and growth of planted trees was begun in southern Illinois in 1955. Results 5 years after planting give some indication of the success of the treatments studied.

TREATMENTS

The size of the brush often determines which preplanting treatment can be used. For example, mowing is not feasible if brush is taller than 10 feet and basal stem sprays are not practical for large areas of dense, low brush. In this study, we differentiated between "short brush," averaging 10 feet or less in height (fig. 1), and "tall brush," averaging more than 10 feet in height (fig. 2). Each was considered a separate problem and treated differently. The most common brush or tree species on the experimental areas were sassafras (*Sassafras albidum* (Nutt.) Nees), winged elm (*Ulmus alata* Michx.), eastern redcedar (*Juniperus virginiana* L.), persimmon (*Diospyros virginiana* L.), and sumac (*Rhus* L.).

Short Brush

Five treatments and an untreated check were replicated on two widely separated fields covered with "short brush." Plots were 84 by 98 feet in size. The treatments were:

Discing.—Each plot was disced twice during the fall (fig. 3). This turned under the herbaceous vegetation and knocked down or cut up most of the woody plants.

Mowing.—All of the woody plants taller than 4 feet were cut in the late summer with hand tools (brush hooks and axes) to simulate mowing by power equipment.

Mowing followed by a stump spray.—The woody plants were cut in late summer with hand tools to simulate mowing and the stumps were sprayed with a mixture of 2,4-D and 2,4,5-T in kerosene. (Herbicide concentration: 24 pounds acid equivalent to 94 gallons of kerosene.)

Spraying the foliage.—A foliage spray of 2,4-D and 2,4,5-T in water was applied during the late summer with a low-pressure hand sprayer. (Herbicide concentration: 4 pounds acid equivalent to 100 gallons of water.)

Burning.—Plots were burned during days of high fire danger in the spring before planting. The burn was neither complete nor uniform.



FIGURE 1 (Above).—Short brush averaging less than 10 feet in height.

FIGURE 2 (Right).—Tall brush averaging more than 10 feet in height.



FIGURE 3.—Discing was one of the better treatments. Additional weight was added to this disc to force the 2-foot discs into the ground.

Tall Brush

Three replications of two brush-control treatments and an untreated check were compared on three "tall brush" areas on an old field.

Basal spraying.—After leaf fall, all woody-plant stems were drenched to a height of about 18 inches with a mixture of 2,4-D and 2,4,5-T in kerosene applied with a hand sprayer. (Herbicide concentration: 24 pounds acid equivalent in 100 gallons of kerosene.)

Burning.—Same treatment as for short brush.

Planting

During the following spring, 40 seedlings each of shortleaf pine (*Pinus echinata* Mill.), white pine (*P. strobus* L.), and white oak (*Quercus alba* L.) were hand planted on each plot.

RESULTS

None of the treatments had any effect on survival. Five years after planting more than 60 percent of the planted trees of all species regardless of treatment were still living.

Short Brush

Shortleaf pine grew faster in height on all the treated areas than it did on the check plots. Best growth was on the plots that were mowed followed by a stump spray, and on the disced plots (table 1). The average height of this species on plots treated by mowing only, burning, and the late-summer foliage spray was slightly greater than the checks.

These preplanting treatments had little or no effect on height growth of white pine and white oak. In fact, white pines on the burned areas were shorter after 5 years than those on the check plots. Lack of response to preplanting treatments of these two species is attributed to the fact that both grow slowly for several years after planting and hence could not compete with the hardwood sprouts.

TABLE 1. — AVERAGE TOTAL HEIGHT OF ALL PLANTED TREES BY
TREATMENT 5 YEARS AFTER TREATMENT: SHORT BRUSH AREAS
(In feet)

Treatment	Height of planted trees		
	Shortleaf	White	White
	pine	pine	oak
Mow-stump spray	<u>1</u> /6.2	2.9	2.8
Disc	<u>2</u> /5.7	3.0	2.5
Mow	5.0	2.8	2.2
Burn	5.0	2.1	2.1
Foliage spray	4.4	2.9	2.3
Check	3.9	2.7	2.5

1/ Significantly different from all other treatments except disc.

2/ Significantly different from "check" and "foliage spray."

As would be expected trees of all species, regardless of treatment, grew more rapidly when they were not shaded by competing vegetation (table 2). For example, shortleaf pine was nearly twice as tall when not shaded as it was when completely shaded. This influenced the response of this species to the preplanting treatments because the higher the percentage of unshaded trees per plot, the taller the average height of the planted trees.

TABLE 2. — AVERAGE TOTAL HEIGHT OF THE TREES IN ALL PLOTS 5
YEARS AFTER PLANTING BY THE DEGREE OF SHADING ON
THE SHORT BRUSH AREA
(In feet)

Species	Height of trees by degree of shading ¹ /		
	Not	Partially	Completely
	shaded	shaded	shaded
Shortleaf pine	6.5	5.1	3.3
White pine	3.9	3.1	2.3
White oak	2.9	2.9	2.0

¹/ Differences by species among degrees of shading are highly significant.

Five years after planting on areas disced and on areas mowed followed by a stump spray, less than 50 percent of the total plot area was covered with a regrowth of brush more than 5 feet tall (fig. 4). In contrast, more than 80 percent of the area on the untreated plots was covered with brush more than 5 feet tall. Therefore, most of the shortleaf pine, which began rapid height growth soon after planting and averaged 5 feet or taller after 5 years, overtopped the brush on the plots that were disced or mowed and then sprayed. However, after these same treatments most of the white pine and white oak were overtopped by brush because they grew slowly and averaged less than 3 feet in height.

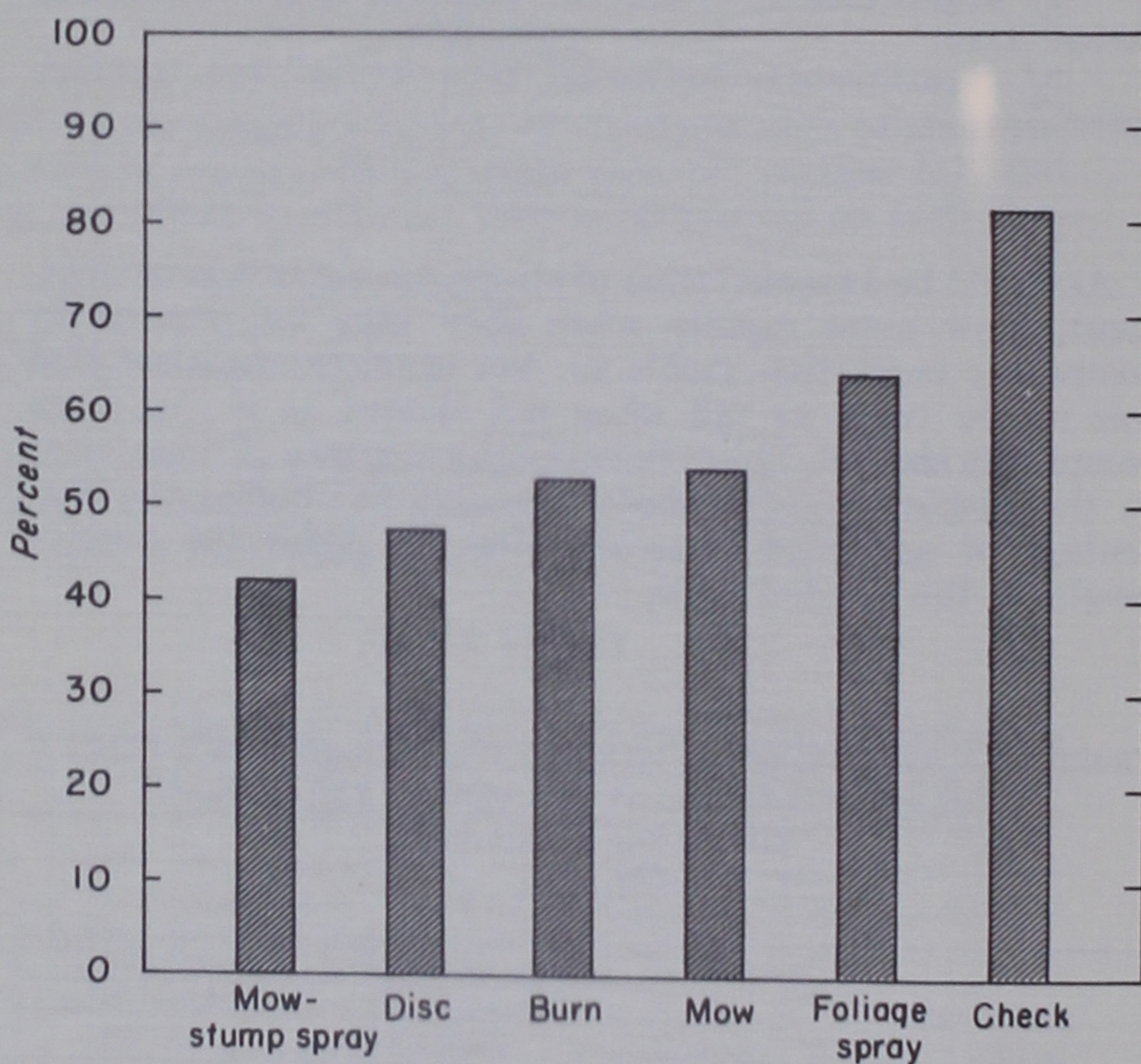


FIGURE 4. — *The percentage of the total area covered by brush more than 5 feet tall on the short brush areas 5 years after treatment.*

Tall Brush

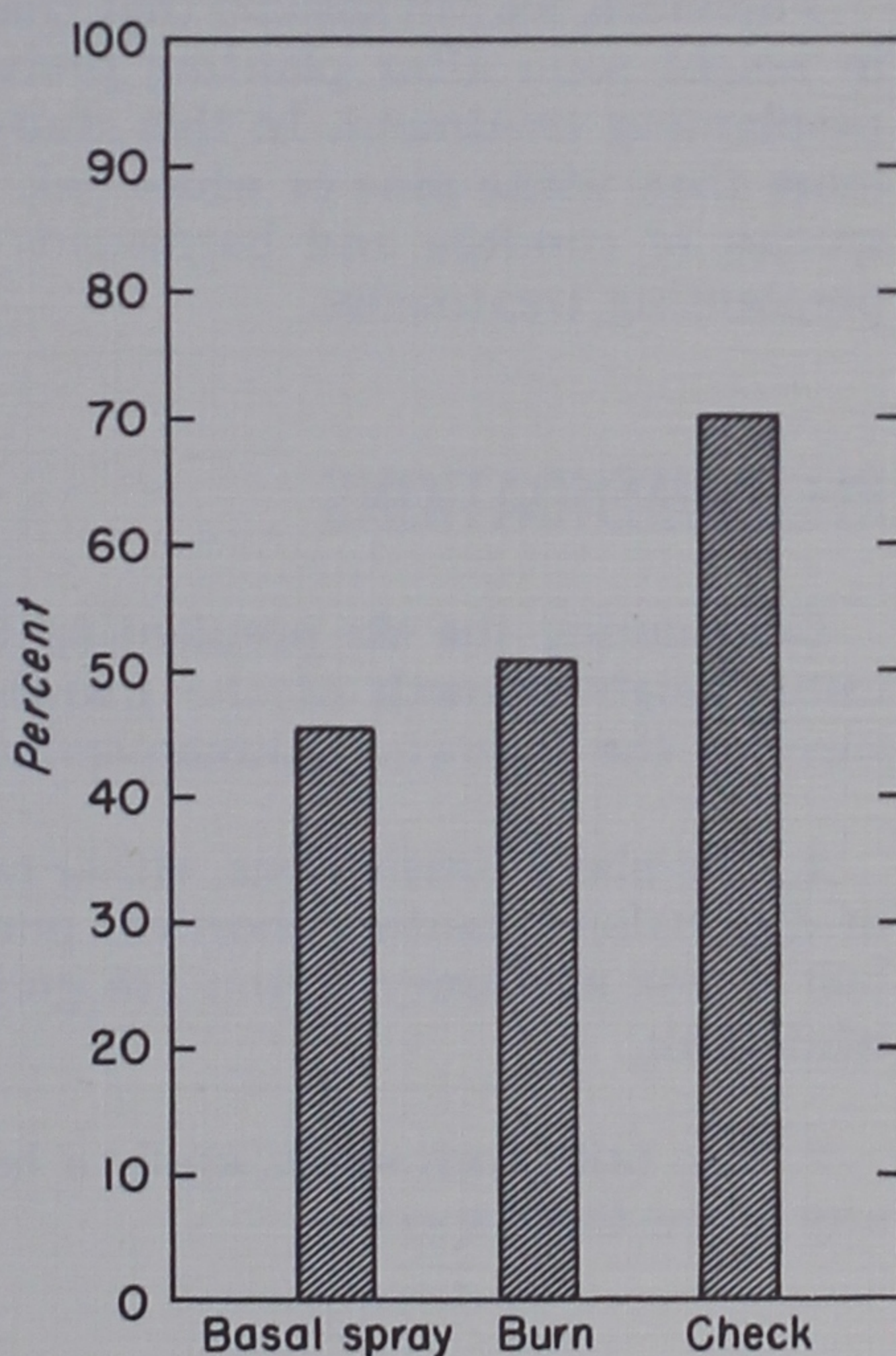
On the tall brush areas, planted trees grew fastest where a mixture of 2,4-D and 2,4,5-T was applied as a basal spray (table 3). In these plots fewer planted trees were shaded by brush and most of the brush was less than 5 feet tall (fig. 5). Shortleaf pine grew faster than white pine or white oak for the first 5 years after planting.

TABLE 3. — AVERAGE TOTAL HEIGHT OF ALL PLANTED TREES BY TREATMENT 5 YEARS AFTER TREATMENT: TALL BRUSH AREAS
(In feet)

Treatment	Height of planted trees		
	Shortleaf	White	White
	pine	pine	oak
Basal spray	<u>1</u> /4.6	<u>1</u> /2.8	<u>1</u> /2.0
Check	4.0	2.2	1.6
Burn	3.9	2.0	1.6

1/ Significantly different from "check" and "burn."

FIGURE 5. — The percentage of the total area 5 years after treatment covered by brush more than 5 feet tall on the tall brush areas.



DISCUSSION

The following methods of eliminating brush were effective preplanting treatments for shortleaf pine: mowing followed by a stump spray, discing, and a basal spray. Where these treatments were used, shortleaf pine grew nearly twice as fast as on untreated areas and fewer planted trees were shaded by brush. There is evidence that the treatments did not permanently eliminate or reduce the density of the brush cover, but the treatments were effective long enough for most of the shortleaf pine to overtop the brush.

Because white pine and white oak are slow starters, the regrowth of brush overtopped them within 5 years. However, these species are tolerant of shade and eventually may grow through the brush cover and overtop it. Nevertheless, until a preplanting treatment can be developed that will completely eliminate the brush for a longer period, these species may benefit more from a release treatment a few years after planting.

Therefore, we can assume that tree species that grow rapidly in height soon after planting probably benefit most from a preplanting treatment. In this study, shortleaf pine benefited more than white pine or white oak. There are probably other species of conifers and hardwoods that would benefit from preplanting treatments.

RECOMMENDATIONS

Considering the six preplanting treatments evaluated and using height growth of the planted trees as a measure of success, the following recommendations can be made:

1. On short brush areas, either mow and spray the stumps or disc before planting shortleaf pine. Preplanting brush control is not necessary if you are going to plant white pine or white oak.
2. On tall brush areas, apply a basal spray before planting any of the three species.

The Central States Forest Experiment Station is headquartered at Columbus, Ohio and maintains major field offices at:

Ames, Iowa (in cooperation with Iowa State University)

Athens, Ohio (in cooperation with Ohio University)

Bedford, Indiana

Berea, Kentucky (in cooperation with Berea College)

Carbondale, Illinois (in cooperation with Southern Illinois University)

Columbia, Missouri (in cooperation with the University of Missouri)